DOCUMENT RESUME

ED 303 822 CS 211 679

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TITLE The Problem-Solving Processes of Writers and Readers. Occasional Paper No. 7.
INSTITUTION Center for the Study of Writing, Berkeley, CA.; Center for the Study of Writing, Pittsburgh, PA.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE Jan 89
NOTE 34p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Audience Awareness; Case Studies; Critical Reading; *Critical Thinking; Elementary Secondary Education; Higher Education; *Problem Solving; *Reader Text Relationship; Reading Processes; Reading Writing Relationship; Teaching Methods; Text Structure; Writing Instruction; *Writing Processes
IDENTIFIERS Writing Assignments; Writing Models

ABSTRACT

While young children's problem-solving models are not as elaborate as those of older students, they share an important belief, namely, that writing and reading are fundamentally purposeful acts of communication. Focusing on the interpretation of process, in particular on writing and reading as forms of problem-solving that are shaped by communicative purpose, three sets of vignettes show students at different stages of schooling as they write and read. The first set illustrates the nature of problem-solving in skilled reading and writing processes that are held as goals for college students. The second set of vignettes places these processes in context by considering some of the factors that influence students' problem-solving as they write and read in response to typical class assignments. The third section explores the problem-solving skills that young students--children learning to write and read and adolescents expanding their writing and reading abilities--bring to their school assignments. It is critical that strategies such as summarization and self-questioning not become disconnected from the larger communicative, meaning-construction process. The critical question is how to sustain and further develop the potential evident in the problem-solving of young writers and readers. Flexibly structured opportunities for teachers and students to exchange views about both their own and professional texts provide the student with context for cultivating a deeper understanding of writing and reading as purposeful acts of communication and to transform the contexts in which writing and reading occur. (Sixty-six notes are attached.) (RAE)

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Occasional Paper No. 7

THE PROBLEM-SOLVING PROCESSES OF WRITERS AND READERS

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January, 1989

To appear in *Writing and Reading: Collaboration in the Classroom?*, edited by Anne Haas Dyson. Urbana, IL: National Council of Teachers of English.

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The project presented, or reported herein, was performed pursuant to a grant from the Office of Educational Research and Improvement/Department of Education (OERI/ED) for the Center for the Study of Writing and the Reading Research Education Center. However, the opinions expressed herein do not necessarily reflect the position or policy of the OERI/ED and no official endorsement by the OERI/ED should be inferred.

CS211679

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THE PROBLEM-SOLVING PROCESSES OF WRITERS AND READERS*

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A revolution has occurred in the way we think about writing and reading. We have moved from a focus on the product--the text--to a focus on the process--writing and reading as dynamic acts of thought and communication. This shift in emphasis has been productive in shaping new attitudes, and practices, but "process" has not meant the same thing to everyone. Some of us picture the process that goes on in a classroom in which students read, write, and discuss texts. Process from this perspective is a school-based activity supported by teachers, curricula and assignments. Others of us picture the process as reflecting participation in a community with its norms, beliefs, and values influencing the literacy transactions that occur. And for others, the notion of process conjures up an intimate picture of an individual student, reflecting on what he or she is writing or reading. From this perspective, one sees a writer thinking about her purpose for writing and her audience, developing a plan for what she wants to communicate. Or, one sees a reader trying to understand an author's message, using background knowledge to situate the text's meaning in relation to what he already knows.

In this chapter we focus on this last interpretation of process, in particular, on writing and reading as forms of problem solving that are shaped by communicative purpose. We examine the kinds of problems that arise as writers and readers attempt to communicate with one another and the strategies they draw upon to resolve those problems. We explore how, for example, a writer attempts to solve the problem of writing to a specific audience by setting and refining goals, formulating plans, and tailoring content. We also explore the kinds of problem-solving strategies that a reader invokes in trying to interpret an author's meaning.

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* Planning group members for this project were: Linda Flower (Co-chair), Carnegie Mellon University; Bertram C. Bruce (Co-chair), Bolt, Beranek and Newman, Inc.; Mary Sue Ammon, Paul Ammon, and Herbert D. Simons, University of California, Berkeley; and Wallace Chafe, University of California, Santa Barbara.

We have chosen a problem-solving framework because it emphasizes the dynamic, constructive nature of the thinking processes that underlie both writing and reading. From this perspective, writers and readers are said to be faced with the "problem" of constructing meaning for some purpose. To solve this problem, we see them call on their knowledge to define their goals or situate a problem; we see them build representations of meaning; and we see them monitor, evaluate and revise their emerging understanding.

To elucidate the problem-solving character of writing and reading, we offer three sets of vignettes that show students at different stages of schooling as they write and read.[1] We begin our exploration of mature problem solving in writing and reading by looking at the mental activity of two highly skilled college students whose problem solving is rooted in a deep understanding of the constructive, purposeful nature of writing and reading. In particular, we see them tackle challenging assignments involving analysis and interpretation of a rhetorically complex text. In the process, we see them as they work at constructing a coherent understanding of what they are reading and what they want to write, and we see them confront their misunderstandings and reshape their purposes as their understanding evolves. This first set, then, illustrates the kind of writing and reading processes that we hold as goals for our students.

The second set of vignettes places these processes in context by considering some of the factors that influence students' problem-solving as they write and read in response to typical school assignments. We explore a range of responses that students adopt, focusing on how students' understanding of writing and reading and of an assignment can influence both their problem-solving activity and the quality of what they learn.

The third section explores the problem-solving skills that young students--children learning to write and read and adolescents expanding their writing and reading abilities--bring to their school assignments. Here we see young students exercising and expanding the kinds of problem-solving skills that are the foundation of highly skilled writing and reading. In particular, we see them using purpose to guide their meaning-making and we see them struggling to expand their skills as their goals for their writing and reading become more demanding.

The decision to synthesize the current research in the form of vignettes is itself the solution to an interesting problem that arose in the initial group-planning session for this book. As we began to talk about ways to pull together the research on writing, reading, and cognition, it became clear that there were two aspects of this research that we all valued. One was the theory-building thrust of research--the attempt to distill the results of numerous individual studies into some more general principles and ideas and to integrate those ideas into a broader, coherent picture in which individual differences are part of a meaningful whole.

However, the other aspect of research we wanted this chapter to convey concentrates on difference, diversity, and the constructive experience of individual writers and readers. The broader principles that research seeks to uncover only matter if they can explain what actual people do. Moreover, when those principles are acted out in real situations, when they are contextualized, they take on an importantly different shape in each context. The "meaning," then, of the research we hoped to synthesize was in both the abstract and the concrete, in the general principles and the specific contextualization of those principles.

Our hope was to capture some sense of this interaction by showing how the claims and findings from research in this area play themselves out in different contexts. The scenarios we have created to contextualize this research are hypothetical. This allowed us to base them point for point on what we saw as the robust findings and claims from the research (though we must admit to a little poetic license in presenting conversations). In many cases the vignettes are drawn directly from the data of studies cited or the observations of teachers. We have tried, then, to construct a sharply focused *theory-driven picture* of how writing, reading, and cognition operate in some of their contexts.

On the other hand--and this is a crucial point--these vignettes and the findings they dramatize represent only *one of many ways* in which these more general reading and writing processes could be embodied in the performance of real students. Learning by writing, for instance, can take many forms, though we only describe one. We also wish to emphasize the descriptive nature of this chapter. Our purpose is to not to prescribe "correct" problem-solving activity but to illustrate a view of writing and reading that, we feel, has some important implications for teaching and learning. When we talk about sophisticated writers and readers, we are describing goals for students' writing and reading that derive from a problem-solving perspective. When we investigate the classroom context, we are looking at some of the factors that can influence the attainment of these goals. And when we describe developing writing and reading skill, our aim is to establish a sense of the continuity that naturally holds between the problem solving of children and that of mature adults.

THE NATURE OF PROBLEM SOLVING IN SKILLED READING AND WRITING

Max is a college undergraduate, majoring in English literature. He is working on an assignment for a seminar. His task is to read Jonathan Swift's "A Modest Proposal," a classic satire, and be prepared to discuss it in class.[2] While this assignment is extremely open-ended, it is not uncommon in high school and college English classes.

As we first look in on Max, he is thinking about the author and the text, his knowledge of them and the relation of that knowledge to the assignment. He

knows, for example, that Swift was a political writer whose major works were published in the 18th century and who lived in Ireland for much of his life. Ireland was at that time a poor country, economically dependent on England. Thinking in this way (often referred to as activating prior knowledge) helps Max establish a general, historical context for understanding the text.[3]

In the same way, he draws on his knowledge of text structure to establish a preliminary framework for understanding the rhetorical structure of the text. He knows from the professor's introduction that "A Modest Proposal" is a political tract and that such tracts were used to make ideas public in the 17th and 18th centuries. He considers their structure in more detail: typically, a problem is identified and analyzed, and a solution offered and evaluated, perhaps with regard to alternative solutions. In a sense, Max thinks he knows what kind of structure to expect from the text and will use these expectations to guide his understanding.[4]

Knowledge is not just used to situate a text. It is used in all phases of reading, from thinking about a text or a topic before reading to evaluating its central theme or argument during or after reading. Readers continually look for connections between the ideas in the text and their prior knowledge.[5] Prior knowledge can in this way help readers draw inferences about an author's intentions and beliefs and can serve as a basis for acquiring knowledge.[6]

As Max begins reading, he finds that the title of the work, "*A Modest Proposal* for preventing the children of poor people from being a burden ["burthen" in the original] to their parents or the country, and for making them beneficial to the public," reinforces his expectations concerning the text's genre. From it, he infers that Swift will address problems associated with poverty and, in particular, the difficulties associated with raising children in poverty. The solution to these problems appears to be the "modest proposal" itself. At this point, Max believes that the tract is a straightforward use of the genre and that he has identified the structure of the argument that Swift will set forth. As Max reads on, this initial understanding will serve as a framework for integrating and evaluating the rest of the text.

But as Max uncovers the true nature of Swift's "modest proposal," namely, that the children of the poor be bred, slaughtered, and sold for human consumption, he will begin to realize that an adequate understanding of Swift's meaning will require more than a simple mapping between an expected text structure and the words of the text. To understand Swift's meaning fully, he will have to recognize the discrepancy between his expectations for the text and the meaning Swift intends for the reader to construct, a meaning that is couched in a complicated narrative structure.[7] This recognition will lead him to revise his understanding so that it distinguishes between the surface (or apparent) meaning of the text and its deeper, satiric meaning, in which the author's intentions are unmasked and their effect on the meaning of the narration explained.

To effect this restructuring of his understanding, Max will draw on several problem-solving strategies. He will question the assumptions that are implicit in the understanding he has built; he will reread the text for specific kinds of evidence; and he will formulate and revise hypotheses regarding the author's intended meaning.[8] His question-asking, for example, will lead him to abandon many of his original assumptions about the essay's purpose. He will also reread portions of the text, looking for clues that support an ironic interpretation. As he uncovers these clues, he will construct a revised understanding of the text that represents more than its content; he will revise his understanding so that it *explains* the content with respect to his understanding of the author's true beliefs and intended meaning.[9] That is, rather than simply connecting the events or ideas in the text into a coherent, sequential structure (e.g., a rendition of a text's plot or surface meaning), Max will build an interpretation which attempts to explain the author's communicative purpose (i.e., "What did the author really mean?").

With this picture of the reading process in mind, we now turn to a consideration of writing as a similarly complex problem-solving process that involves interactions among an author, a reader (or readers), and an evolving text.

Emily is in Max's English class. Each week the class is required to write a short, three-to-five-page essay on any topic related to the week's readings. In these essays, the professor expects the students to write a critical analysis of some topic or issue related to the major themes of the course. For this week's essay, Emily has decided to focus on "A Modest Proposal." Our exploration of her problem-solving process begins with her attempt to define more precisely her topic and goals for the essay, in other words, the problem she will try to solve in writing.

The initial problem confronting Emily, to write a short paper that is related to the week's reading, is an extreme (although not atypical) example of an ill-defined problem. It is explicit only with respect to the scope of "possible texts" and the paper's length. It is silent on such important dimensions as specific goals of the assignment, topic, and focus. Many of the problems Emily faces derive, therefore, from the nature of the assignment itself, namely, what goals and topics to pursue, what focus to adopt.

How does a writer define the problem she wants to solve? What aspects of a rhetorical problem does she consider? These are important questions because research has shown that a major difference between skilled and less skilled writers is in the ways they define the rhetorical problems they encounter.[10] The process of defining and exploring a problem is a critical part of what makes writing a creative act.[11]

Thinking about "A Modest Proposal" and what she might write, Emily begins with a conventional formulation of the general problem she faces. She will write on some issue related to Swift's work, maybe on satire (perhaps as a literary

and political tool) or on Irish-English relations past and present. By formulating the assignment in this way, she has adopted a conventional representation for the assignment "Write an essay on...". Experienced writers have many such representations for familiar writing problems, from those for writing a vacation postcard to those for writing student recommendations.[12] What makes such representations so useful to the writer is that they essentially dictate a solution for a particular, well-defined writing problem, specifying the situation, the audience, and the purpose for writing, even in some cases providing explicit suggestions for tone and wording.[13]

Many writing problems, however, do not have a conventional solution. And even those that do are open to alternative solutions, depending on the situation and the writer's skill, energy, and imagination. As Emily, for instance, begins to consider the consequences of her choice of topic, she finds that one idea leads to another, but nothing coherent or compelling emerges from the chain reaction. She begins to ask herself how she can make the assignment more interesting to herself and her reader. In the process, she realizes that what interests her most about Swift's work is his use of irony to convey his indignation toward those of his countrymen who exploit the poor. From this realization, she begins to formulate a vague but suggestive goal, namely, to demonstrate the power of Swift's irony in a novel way. As she pursues this line of thinking, an approach begins to take shape. She will rewrite the work, or some portion of it, stripping it of its ironic tone and substance. But to satisfy what she understands to be her professor's requirements, she decides in addition to examine the effects of her revision on the force of Swift's argument. Precisely how she will do this is as yet unclear, although writing a short, academic critique that accompanies the revised text or annotating her text seem to be good possibilities. The outline of a plan for writing has thus emerged.

In defining a rhetorical problem, skilled writers actively consider a number of elements. As Flower and Hayes have suggested, these include the rhetorical situation itself (the givens of assignment and audience) and the writer's purpose and goals (those affecting the reader, the writer's voice, the content and form of the text).[14] Emily initially considered the rhetorical situation in conventional terms and began to generate possible themes on that basis. Subsequently, she felt dissatisfied with the results of this process and redefined the problem by moving beyond the conventional representation with which she started, a leap that novice writers rarely make. As part of this problem redefinition, Emily revised her image of the assignment by questioning her original assumptions about its purpose and character, and by redirecting her attention to her own interests and goals.[15] In addition, she elaborated her problem representation to include her audience's requirements and expectations, a process that will continue as she develops her plan and text more fully. Less skilled writers do not typically devote much attention to how their writing will affect the reader; instead, they tend to focus almost exclusively on their topic and on telling what they know about it, a process referred to as knowledge-telling.[16]

Emily's new problem representation also involved a redefinition of her goals for the meaning she would create and the form it would take. Rather than defining a broad goal (e.g., discuss Swift's use of irony) and generating a network of ideas related to it, she defined a goal that would allow her to use her knowledge creatively. And she made some decisions about the form of her text in relation to the set of goals--goals for reader, self, and text--that she had considered in defining her problem. The result of all this active, reflective problem-solving activity was an elaborated image of the problem she would attempt to solve in writing and the sketch of a plan for how she might go about solving it.

Emily's "discovery" of her writing problem should not be mistaken for inspiration. Nor should it be equated with the conventional activity of formal outlining as a way of getting started in writing. It was, to the contrary, the result of reflective, at times unpredictable, cognitive activity on her part.[17] In identifying her interests and the nature of the problem to be solved, Emily engaged in a very flexible kind of planning, sometimes referred to as "constructive planning," that (a) encourages discovery through the interaction of different modes of thinking (e.g., deliberate, associative, incidental), (b) does not lock students into premature outlines that emphasize content over such things as goal definition and planning, and (c) offers a way to think through one's goals and play with ideas and structures before trying to produce prose. This is a vision of the planning process that is much closer to planning as people really do it--the planning and debate that go on in one's head in the shower, the notes and sketchy outlines on the back of a handy envelope, and the conversations and bits of draft text in which ideas get tried out, refined or discarded. Planning is, by definition, a way to try out ideas in a form that is easy to build and easy to change.[18]

Thinking she has a good idea of what she wants to do, Emily decides to see how hard it will be to rewrite Swift. She picks up the text, pen in hand, but immediately comes up against a problem. How is she to decide how much and what part of the selection to rewrite? Her angle is a good one, she feels sure, but it is not yet precise enough to guide her in making these kinds of decisions. A little disappointed, she spends some time going over the text, thinking about specific ways in which Swift makes the irony felt, jotting down some notes, occasionally trying her hand at some rewriting, worrying that she won't meet the assignment deadline. What Emily has discovered is that there are many ways to realize her abstract plan and that the process of finding the one that suits her and the situation will entail a good deal of hard thinking and a more fully articulated, or concrete, plan for realizing her goals.

Emily's current problem, then, is to develop a more fully articulated plan and to realize that plan even more concretely in prose. This process, sometimes called "instantiation," in which a writer moves from images and plans to the special demands of prose, helps explain why writing can call for such active problem solving, even when the writer has a good but still abstract plan or a rich store of knowledge from which to write.[19] By thinking about her goals, plan and audience,

Emily will gradually generate the ideas and focus from which her paper will flow. As she plans, composes and revises her text, she will not simply be calling up what she already knows. Rather, she will be developing a set of increasingly well-articulated goals and building new meaning representations.

A problem-solving perspective on writing and reading helps make clear how, for any given problem, there are potentially many solutions. As we have seen, a given writing plan is open to multiple textual realizations; a given text is open to multiple interpretations. Through Emily and Max, we have tried to illustrate that the problem solving of highly skilled writers and readers is directed at crafting solutions that satisfy their goals and purposes. In attempting to interpret or create a text, these writers and readers determine, among other things, the nature of the problem to be solved, the kinds of knowledge they need to activate, and the appropriate strategies for organizing and monitoring their problem solving. Moreover, their problem solving is grounded in the belief that writing and reading are based on a communicative interaction, that is, the interaction of a writer, a reader, and a text.[20] The writer plans, composes, and revises with some idea in mind of what her readers are likely to know and believe, and she uses this knowledge to write in ways that will evoke relevant aspects of the reader's knowledge and beliefs (e.g., Swift's labelling as "modest" a morally unacceptable proposal). The reader in turn uses his knowledge and problem-solving skill to solve the problem of intended meaning (e.g., "What does the author really mean when he says...?").

Max and Emily represent the long-range goals we have for students' problem solving in writing and reading. With this in mind, we now examine the kinds of problem-solving strategies that students may actually use to complete their school assignments.

INVESTIGATING WRITING AND READING IN CONTEXT

Shirley is an above average student in her first year of college who applies herself conscientiously to her work and who was successful in high school. The study skills she learned (e.g., finding the main idea, remembering facts, summarizing) and the writing patterns and strategies she developed in high school (e.g., agreeing-disagreeing, comparing-contrasting, relating theory to practice, expressing opinions, describing impressions) helped her successfully complete most of the assignments she was given. To her surprise, Shirley is not doing as well in her college studies.

As we look in on her, Shirley is thinking about a term paper she wrote for a course in English history. She chose the Battle of Agincourt as her topic. For her research, Shirley located half a dozen sources, each of which described the circumstances of the battle in a few pages. Although the topic was unfamiliar to her, her sources provided a lot of detail and Shirley quickly understood the course of events that had taken place.

Because she has been taught that histories are narratives that tell the truth, Shirley conceived her function as an historian/researcher to be to synthesize the various accounts into one "completely truthful" account. Therefore, as she prepared her paper, Shirley used her well-learned high school strategies to compile the facts from her sources into a coherent story with a beginning, a middle, and an end.[21] In writing the paper, she adopted the narrative style that predominated in her sources.[22] The result was a coherent description of the major events and participants in the Battle of Agincourt.[23] Shirley felt that her paper met the assignment criterion of originality. As she saw it, her originality came not from the factual material, which could not be changed or disputed, but from her presentation, which she thought was more accurate than any one of her sources because it was more complete. Shirley was genuinely surprised when her paper was returned with a grade of C.

What are the sources of Shirley's difficulties? One major source of difficulty can be traced to a naive understanding of the role of rhetorical purpose in writing and reading.[24] Understanding purpose is basic to constructing meaning; without it, text loses its communicative function. Writers, for example, cannot formulate effective plans unless they understand their purposes for writing.[25] Likewise, building an argument becomes an impossible task if a writer does not have in mind a clear understanding of her purpose for writing, that is, not just what she was arguing but why. In much the same way, readers need to understand the purposes and perspectives of authors. They need to realize, in particular, that authors have beliefs and intentions, and that these influence the meanings of texts, as Swift's text so clearly demonstrates.[26]

Feeling upset about her C, Shirley consulted a friend, Alice, who had received an A- on the assignment. Not surprisingly, Alice had defined the assignment differently than Shirley. The strategies that she had used to guide her research and writing followed directly from her defined purpose. The differences in approach that each took in completing the assignment can be seen in the conversation that follows.

"We were supposed to research a topic and then write a paper that expressed an original idea or point of view. OK. Who were your sources?", asked Alice. "Winston Churchill, right? A Victorian lady, a French couple--Guizot and Guizot--and a few others. And they didn't agree about certain facts, like the sizes of the armies, right? Didn't you wonder why? You could have asked whether the English and French writers were representing the battle to favor their national interests and then looked to see if the factual differences actually supported your idea. Or, you could have thought about how a book entitled *The Romance of Chivalry* might present a different view of the battle than a book entitled *A History of the English-Speaking Peoples*. You could even have talked about *Henry V*--which I know you've read--and looked at how Shakespeare presents the battle. You would have had an angle, a problem. Professor Boyer would have loved it."

Alice is suggesting that Shirley invent a purpose or original problem for her paper and then develop an argument to support it, in much the same way that Emily did when she wrote about Swift's "A Modest Proposal."[27] Alice's representation of the assignment is, to be sure, more difficult to plan and complete than is Shirley's.[28] Among other things, it would require that Shirley select and evaluate her material in light of a problem and then organize it in such a way that a convincing argument can be developed.[29]

Clearly, Alice and Shirley approached this assignment from very different perspectives and with qualitatively different knowledge about the role purpose plays in academic writing and reading. Alice, on the one hand, appears more consciously aware that texts have rhetorical purposes, and she uses this knowledge to inform her writing and reading. Shirley, on the other hand, is still learning what it means for texts to have rhetorical force and communicative purpose. She has not yet fully realized, for example, that an essential part of reading includes interpreting content in relation to an author's purpose and knowing or inferring something about the audience to whom the author is writing. Nor has she realized the extent to which understanding one's purpose in writing can affect the quality of the texts one writes because different types of texts carry with them different conventions and purposes.[30] This kind of knowledge, often referred to as rhetorical knowledge, is essential to understanding a text within its larger context, whether it be social, political, historical, literary, or otherwise.

Alice's suggestions for a paper would require a radically different composing process than the one Shirley used, one more akin to the constructive process Emily used in writing her paper on Swift. It would include, among other things, articulating an original purpose and elaborating a writing plan that is sensitive to the rhetorical situation, and identifying point of view and using it as a focus for developing a forceful argument.[31] Alice's suggestion, in short, would require Shirley to evaluate her reading and, in turn, to use that evaluation to build an argument that would reflect her ideas about the material rather than simply knowledge-telling or organizing the ideas of others into a narrative.[32] To construct texts that are appropriate for the academic context in which she is writing, Shirley will have to learn to see her writing as purposeful and use that sense of purpose more constructively to guide her writing and reading.[33]

Here we have seen the role of problem solving in building academic arguments, but students face many other kinds of writing tasks as well. The sense of purpose that distinguishes Alice's thinking from Shirley's is equally important in other writing contexts. Let's look now at how two high school students, Danielle and Ed, approach a typical "writing to learn" task in their earth science class.

Their teacher, Mr. Burns, has given them a fairly typical assignment. The students are to read a textbook chapter on hurricane formation and write an essay that summarizes its key points. Mr. Burns has two major goals in mind for his students with regard to this assignment. First, he wants them to acquire back-

ground knowledge about hurricanes that will help them better understand the unit they are about to study. Second, he hopes that the writing assignment will force them to learn the material more thoroughly than if they had only read it. From Burns's perspective, the assignment is an opportunity for students to draw connections among the various facts in the reading and to place this new information in the context of other weather phenomena that have been discussed in class.

He would no doubt be surprised to see the different ways in which his students interpret this seemingly straightforward assignment and how this, in turn, affects their problem solving and learning.[34] Let's look at how Danielle and Ed go about completing the assignment.

Danielle is an average student who thinks of herself as a good writer and reader. She sees this assignment as routine, not unlike the questions she answered after reading a story in grade school or the "Who - What - Where - When - Why" book reports she wrote in junior high. Over the years, she has encountered many such assignments and, in each case, she has had a "formula" or "recipe" that has helped structure her problem solving.

As Danielle understands it, her assignment is to write a summary of the chapter on hurricanes. Accordingly, she invokes her "summary" strategy, a routine that defines her writing task as one of translating or paraphrasing the text into her own words. To write her summary, we see Danielle sit down with the text, pen in hand, ready to begin reading and writing. She reads and rereads the title and the first few paragraphs of the text until she feels she understands them. Then she writes, translating those segments of text that seem important into her own words and deleting those she perceives as less important. She reads what she has written, making sure that her text makes sense, and then turns to the next few paragraphs and repeats the procedure. When she has gone through the entire article in this way, Danielle rereads her summary, checking its coherence, and correcting grammar and spelling errors.[35]

Although Danielle will produce a "summary" that contains some of the important ideas in the chapter, her interpretation of the assignment and her problem solving significantly influence what she will learn as she reads and writes. She does not gain as much as she could from her reading, for example. This is because she defines her task according to a formula which emphasizes sequential translation over conceptual integration. Instead of building an integrated representation of the main concepts, Danielle focuses on understanding concepts in isolation from one another, more as a list of ideas than an explanation.[36] Moreover, Danielle's method leaves little opportunity for reflection, in particular, on how any newly acquired knowledge might relate to what she already knows about hurricanes or weather in general.[37]

Danielle's understanding of the assignment and problem-solving routine

also influences what she learns from her writing. Though essay writing has been demonstrated to be a more effective learning activity than more restrictive tasks such as answering study questions, students often fail to use writing to best advantage as a means for learning.[38] Because Danielle represents the assignment as one of translation, she does not take the opportunity to reflect on or restructure the reading material in her own mind for her own purposes. She does not in any sense "transform" the material she has read into usable knowledge, knowledge that is related somehow to what she knows about the physical world. Transforming knowledge in this way is a crucial aspect of learning from writing.[39] Nor does her strategy allow for any constructive planning as she writes; her writing is entirely determined by the order of presentation in the chapter itself.[40]

Viewed from this perspective, it becomes clear that Danielle did not engage in the kind of learning that Mr. Burns had in mind when he gave the assignment. She has not explored or created connections between facts in the reading, nor has she thought about how this new information relates to other concepts that have been discussed in Mr. Burns's class.

In contrast, Ed takes a different approach to the hurricane assignment. Also a good writer and reader, Ed quickly sizes up the task: Mr. Burns wants an essay that highlights the principal causes of hurricane formation. Before he begins reading, Ed reviews what he knows about hurricanes anticipating the contents of the chapter. He hypothesizes that it will cover the causes and consequences of hurricanes and perhaps make reference to other ocean storms the class has been studying, like squalls and tidal waves. He knows that his essay is supposed to include a causal description of hurricane formation, so he is on the lookout for such material. As he reads, he makes notes about those things he wants to include in his essay. In this way, he uses his writing goals to guide his reading and note-taking.[41]

When he has finished reading, Ed draws up a plan for writing. He looks over his notes, elaborating those ideas he wants to include and bracketing, for the moment at least, those that seem less relevant. Ed decides to draw most of his information from the assigned reading and to augment it with information he has learned from other sources. He notes these additional ideas and their connections to the reading material and then begins to think about a rhetorical structure that will suit the material and assignment.

As Ed composes, he refers frequently to his writing plan, in which he has laid out the causal sequence of the events that produce hurricanes. He uses his plan as both a source of ideas and a framework for organizing his prose. He revises or entirely deletes text that does not fit with his purpose. When he completes the assignment, he will have a well-structured, comprehensive essay that fully meets Mr. Burns's expectations.

Why do Danielle and Ed take such different approaches to this assignment? In part, it is because the assignment Mr. Burns has given does not *require* his students to engage in the kinds of problem solving and learning that he wants but has not articulated, either for himself or for his students. As Shirley, Danielle, and Ed are meant to illustrate, inattention to the problem solving that underlies different kinds of learning experiences has consequences for all students, regardless of their ability. Too often the ways in which students are asked to use writing and reading do not help them understand these processes as constructive acts of thought and communication or do not afford the time or support that would enable them to exercise the problem-solving strategies in their repertoire. As teachers, it is essential that we think carefully about the learning experiences we offer students and what it is that we want them to give to and take away from these experiences.

But the assignment is only part of the story. Whether or not students adopt a purposeful, constructive approach to a given writing assignment is not simply a matter of how they interpret that assignment, although interpretation is a critical factor, as Danielle and Ed are meant to illustrate. The way a student handles a given task will also be influenced by her skill and fluency as a writer and reader, her knowledge of the topic and related topics, as well as her understanding of the purpose of the assignment and the potential purposes of writing and reading in general.[42]

We should not assume that only highly skilled students like Max and Emily are capable of understanding writing and reading as purposeful activities. Students at all levels can adopt this perspective, as the cases of Alice and Ed illustrate. Very young children, moreover, *expect* writing and reading to be purposeful, communicative experiences. Writing and reading are for them engaging activities in which experimentation, discovery, and communication predominate, supported by peers and adults alike. In this final section, we consider the kinds of constructive problem solving that younger students, those in junior high and elementary school, can bring to their writing and reading. We also look at some of the ways in which their problem solving changes as their purposes for writing and reading expand.

PROBLEM SOLVING OF YOUNG WRITERS AND READERS

Anita is in seventh grade. It is Sunday afternoon and she is preparing her "You choose!" talk for English. The "You choose!" assignment is one of the best reasons to be in Mr. Oakes's class. Each week a student describes his or her favorite book. He or she can use hand-drawn illustrations, dress up in costume, read an excerpt from the book or act out a scene or two. The purpose of the talk is to entice other students into reading the book.

Anita has decided to talk about one of her favorite books, a fictional diary "kept" by the mother of a teenage suicide, Lizzie. The diary describes the lives of Lizzie and her family as they try to cope with the adolescent's unhappiness. Anita

likes the book because she feels that it addresses many of the problems that kids her age really face. Moreover, she feels that the emotions and actions of the characters--especially those of Lizzie and her mother--are true to life.

As Anita plans her talk, however, she discovers that the book is not an easy one to describe. At the outset, Anita thought she had a good understanding of the book. But, as she tried to describe Lizzie to her imagined audience, the class, she realized that she was a little confused. She was not sure how Lizzie felt sometimes or why she acted as she did.

This assignment is challenging Anita to reflect on her understanding of the book. By thinking about what her audience will need in order to understand the main character, she has hit upon some confusions in her own understanding. In this way, she is motivated to articulate more fully what it is that she understands and does not understand.[43] From those insights, she can try to identify the sources of her misunderstanding. To clarify her confusions, Anita will return to the text. She will reread the diary, reading carefully those parts that contain the sources of her confusion. Her reflections will eventually lead her to substantially revise her understanding of the book. Anita is, in short, becoming aware of the need to monitor her understanding, a critical component of skilled reading.[44]

In some instances, students recognize the need to monitor their meaning-making activities in writing and reading on their own. Writers, for example, begin to see that if they are to shape their writing for an imagined audience and particular purpose, they need to look over and evaluate a number of options.[45] They also begin to see that, to write the piece they want to write, they need to make plans that outline their goals and purposes for writing.[46] Readers like Anita begin to see that understanding a text can involve not only thinking about the text but also thinking about one's understanding of the text.[47] At other times, however, as we shall see, students need outside support to help them recognize the need to monitor and revise their understandings.[48]

A few weeks later, we see Anita and her English teacher, Mr. Oakes, meeting together after school. The principal has received complaints about the book Anita described in her "You choose!" talk. Some parents feel that it is not appropriate for their adolescent children. In particular, they feel that a book about suicide can bring more harm than good and that its language is offensive.

The principal has asked Mr. Oakes and Anita to tell her why the book should remain in the school library. Anita is writing a letter that explains her thoughts. She wants to argue that the book is valuable and that students her age are mature enough to handle its content and language. She begins writing her first draft immediately. It is easy for her to describe what she liked about the book, and she writes several pages before stopping.

"Mr. Oakes, what do you think? This is my letter to the principal."

When Mr. Oakes reads the letter, he can see that Anita has had a hard time doing what she set out to do. The letter is an enthusiastic description of the book, not an argument against critics who want it banned.

"Anita, do you know why some parents have objected to this book?"

"Yeah, they think kids shouldn't read about someone committing suicide. They think it might give us the idea. But we *know* about it already. A book like this explains it, so that kids don't feel like they're weird for thinking about it. It shows how there are things kids can do when they're in trouble, like talk to someone. Lizzie just couldn't see them."

"So you think this book might even help some kids, then?"

"Yeah, it's really more about *not* committing suicide."

"What about the language in the book? You know some parents object strongly to it."

"Everyone already knows the words. And what else would you say if you felt that bad?"

"You've really thought about this book, haven't you? How do you think you could use some of that in your letter?"

Mr. Oakes is helping Anita see that to write a strong letter she will have to do more than describe the book or explain why she enjoyed it. She will have to think carefully about her purpose for writing and her audience. She will have to consider her text rhetorically and write from a point of view. And she will have to monitor her writing, making sure that the meaning she is constructing is the meaning she wants to communicate.

To do this, Anita will have to set aside her knowledge-telling strategy and adopt a more purposeful one. She will have to decide why she is writing, and what it is she wants to say. This means that she will have to establish goals for her writing and develop a plan for meeting those goals. She will also have to visualize her audience, namely angry parents and the principal (in her role as mediator) with their needs and beliefs. It also means that she will need to anticipate their reactions to her message. And, as Anita translates her plans into text, she will need to monitor the meaning she is constructing in light of her communicative intent. She will have to judge the appropriateness of its content, tone, and language with respect to her goals and audience, revising both her plans and drafts as the need arises.

Like the "You choose!" talk, this task, coupled with Mr. Oakes's constructive intervention, is challenging Anita to expand her problem-solving skills.

It is helping her to gain an appreciation for the importance of purpose and planning in her writing. It is also helping her to become aware of the need to shape and monitor the meaning she is constructing for a particular audience. When she began her letter, Anita did not spontaneously consider the importance of these issues. With Mr. Oakes's assistance, she was able to see that her letter was not meeting the goals she had set for herself.

To focus her letter writing effort, therefore, Anita clearly needed Mr. Oakes's help. This stands in contrast to the awareness of audience that emerged independently as she prepared her "You choose!" talk. It is interesting to note that students can use sophisticated strategies in familiar contexts or for highly motivating tasks or on topics they know well. This does not mean, however, that they are able to apply that skill to a new or difficult task. In these cases, they often need support from an outside source like a teacher or fellow student to get their writing and reading back on track, especially when their goals, at least momentarily, exceed their abilities.[49]

With support and guidance, Anita's problem-solving skill will continue to evolve. She will learn to monitor her problem-solving independently of any outside agent. She will begin to engage in high level planning as she writes, and in critical and interpretative thinking as she reads over an expanding range of tasks and contexts. As her skills and self-knowledge expand, she will be able to assume greater control over her problem solving. Through this control, Anita will be able to exercise increasing power over the meanings she is constructing as she writes and reads.

Even very young children are able to engage in constructive problem solving. Preschoolers, for example, demonstrate that they know writing is purposeful when they scribble on paper, walls, and furniture to express their emotions and ideas. Likewise, they demonstrate that they know reading is purposeful when, as prereaders, they sit with a book and tell themselves a story or pretend to read aloud. Some children experiment with more conventional forms of writing, producing invented spellings, writing their names, and labelling their drawings.[50] Other youngsters learn that individual letters represent particular sounds or that particular groups of letters stand for specific concepts.[51] Still others show that they have knowledge about story content, structure, and characterization.[52]

To explore the kinds of problem solving of which emerging writers and readers are capable, imagine a first grade classroom. As we enter the room, we see Kenny and Susan at the Share Table. Kenny is responding to Susan's story about her rabbits. He is telling Susan what he likes about her story and asks questions about what he does not understand.

Kenny and Susan are engaged in collaborative problem solving.[53] Together, they are thinking critically about the meaning of Susan's text and about the process of writing itself. These interactions let them discuss and develop ideas and plans

for writing, and give them a chance to look at text through the eyes of both writer and reader. In a sense, this kind of collaborative problem solving supports the development of the kinds of self-evaluative strategies that experienced writers more spontaneously apply to their own work.[54]

Although Kenny is only seven, he is learning how to respond constructively to writing. When he first read other children's writing, he responded only to the events they described or to surface features like spelling or handwriting.[55] During the year, however, Kenny has acquired strategies for delving more deeply into a text's content and coherence. In writing conferences, for example, his teacher, Ms. Plourde, has modelled for Kenny the kinds of questions she wants him to ask of his own writing, questions about the problem-solving process as well as about the text (e.g., Do you have more to tell? Are you telling the story you want to tell?). These questions help Kenny focus on his purposes for writing and think about what it is he wants to say.[56] As Kenny continues to write, he will become increasingly independent, asking these questions on his own and applying them to his writing as well as to that of others.

In the back of the room, we see a small group of children participating in a "read-aloud" with Ms. Plourde. They are reading Judy Blume's *Freckle Juice*. The book is about Andrew, an unhappy boy, who believes that his problems will disappear if he can only acquire freckles. Sharon, a classmate whom Andrew dislikes, agrees to sell him "freckle juice." The story unfolds as Andrew deals with his misgivings about Sharon, his doubts about the freckle juice, and his desire to end his troubles.

As Ms. Plourde reads the story aloud to them, the children become deeply involved in constructing a meaning for the story. In fact, as we look on, we see them engage in activities that are quite similar to those used by older, more sophisticated readers like Max. For example, they use prior knowledge to tackle a problem of character motivation,[57] generating a wide range of hypotheses as to why Andrew might want freckles: "He thinks that freckles hide dirt so you don't have to wash. But my little brother has them and he gets a bath every night." "He thinks they're lucky." "They're icky--I don't think he *really* wants them."

Similarly, they use their understanding of the story in conjunction with prior knowledge to speculate about what might happen when Andrew drinks the freckle juice:[58] "He might get freckles, but the kids will still be mean to him." "Sharon is just tricking him so nothing will happen" and "His mother will still make him take a bath."

Like Anita, beginning readers often need support to accomplish their goals. For example, they may need to be reminded to use prior knowledge to solve problems of meaning. Teachers can provide direct support that helps students monitor what they know and integrate prior knowledge with information in a text.[59] Young children can also be taught explicit strategies like question asking

that prompt them to use prior knowledge during story comprehension.[60] With support from parents, teachers and fellow students, young children can learn to use prior knowledge to solve increasingly complex problems of meaning.

Later in the day, we see Rachel sitting in the center of the room trying to write a story. Until about a month ago, she had written easily, finding lots of topics to write about and reading what she had written to her friends. Today she has started a story three times, writing a few words, crossing them out, crumpling up the paper and starting again. Ms. Plourde watches as Rachel gives up in frustration and begins fidgeting with her sock. She pulls her stool over to Rachel's desk.

"Tell me what you're writing about, Rachel. You're having a hard time, aren't you?" "Um. I want to tell how we went out crabbing with my Dad, and I caught a crab that was bigger than my brother's. I can't write it, though. Every time I try to tell what happened, it sounds stupid. Then I have to start again."

Rachel is frustrated because her writing abilities are expanding. She is becoming more aware of the demands of her teacher and peer audience. Her new-found concern for her readers makes it hard for her to write. When Rachel began writing in school, she wrote primarily to please herself. She seldom changed her pieces, nor was she concerned when other children found them confusing. Now, however, she wants her story to interest her friends, and she worries when she thinks it is not good enough. Rachel's school writing is evolving from knowledge telling to a more rhetorical approach in which she gives consideration to her audience and purposes for writing.[61]

The tension that she is feeling will eventually push Rachel toward revising her work rather than abandoning her drafts. To do this, her notions of time, space, and awareness of audience will have to change.[62] She will have to learn, for example, that text is flexible and temporary before she will be willing to change it. And she will have to learn that when a text lacks important information, it is confusing. In short, Rachel will have to think about particular needs of her audience in relation to her purposes for writing as she formulates what she wants to say. As her ability to reflect on audience and purpose develops, Rachel will in turn spend more time and effort planning the ideas and structures that best communicate her meaning. She will, in short, become a more flexible planner, one who is able to generate original plans for a wide range of writing problems.

CONCLUSION

Through Anita and Rachel we see that students who are learning to write and read have models of those processes that are, in many ways, close approximations to the mature models held by Emily and Max. While the young children's models are not as elaborated as those of the older students, they share an

important belief, namely, that writing and reading are fundamentally purposeful acts of communication. This belief is an essential foundation of expertise in writing and reading; it is the engine that drives constructive problem solving.

Indeed, it is precisely this belief that is absent from the learning experiences of Shirley and Danielle. The models of writing and reading that they adopt to complete their assignments, which are in some sense adequate for the task, have no purpose or function beyond satisfaction of the assignment. Much of the responsibility for this falls, as we have said, to the assignment itself, which may unwittingly reinforce a belief in writing and reading as school routines rather than as functionally meaningful tools of communication and learning. This is not in any way to suggest that summarization or any other problem-solving strategy is in and of itself useless. On the contrary, strategies such as summarization and self-questioning, to name only two, are important components of expertise in both writing and reading.[63] However, it is critical that these skills not become disconnected from the larger communicative, meaning-construction process. If they do, then their function within that process will not be well understood and their power as problem-solving and learning tools will not be fully exploited.

One result of this decontextualization is that students' models of writing and reading may become limited and their original feeling for purpose diminished. This, in turn, has consequences for their ability to meet the demands of open-ended assignments like the one that Shirley faced. The ability to respond constructively to an open-ended assignment in the way that Max and Emily do grows out of a long experience with writing and reading as problem-solving processes; that is, with defining original purposes and problems, setting goals, formulating plans, constructing meaning, and so on. In their problem solving, students like Max and Emily demonstrate their belief that, as writers and readers, they are linked in a communicative interaction.

Younger students, like Anita, Rachel and Kenny, show that they too approach writing and reading as communicative acts. Like Max and Emily, their writing and reading have purpose and function. In fact, they frequently define purposes that, for the moment, exceed their writing and reading abilities. But it is precisely in the attempt to fulfill such goals that they expand their problem-solving skill.

The critical question then is how to sustain and further develop the potential evident in the problem solving of young writers and readers. A number of very important steps in this direction have been taken with elementary school children,[64] low achievers in middle school[65] and college students,[66] for example, the provision of flexibly structured opportunities for teachers and students to exchange views about both their own and professional texts. These efforts have in common a focus on having students solve problems within a community of learners, so that members of the community--students and teachers alike--support the individual's writing and reading efforts. In each of these cooperative approaches, moreover,

problem solving is situated in a context that emphasizes the purposeful construction of meaning. Efforts such as these are more than experimental in nature. They are helping to cultivate students' understanding of writing and reading as purposeful acts of communication and to transform the contexts in which writing and reading occur.

Notes

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